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EXPERIMENTAL INVESTIGATION ON POLYPROPYLENE FIBRE REINFORCED CONCRETE WITH ADDITION OF FLY ASH

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ABSTRACT: An experimental study has been conducted to investigate the effect of polypropylene fibre on concrete with addition of fibres and fly ash. In this study nine different volume fractions (0%, 0.05% ,0.1%, 0.15%, 0.2%, 0.25%, 0.30%, 0.35%, 0.40%) were used. From the basic test conducted we come know that addition of polypropylene fibre has a little adverse effect on the workability of concrete containing fly ash. With the increase in fibre volume, both the slump value and slump flow are decreasing gradually. However, the addition of polypropylene fibre and fly ash has greatly improved the strength in hardened concrete tests. Moreover, there is a tendency of increase in cracking resistance when compared to other concrete composites without fibre and fly ash. There have also been several advances made in the development of fibre reinforced concrete to control cracking and crack propagation in plain concrete, and to increase the overall ductility of the material. However, there are now many types of fibres with different materials and geometric properties, but the exact fracture behaviour of fibre reinforced concrete materials is not clearly understood. Majorly, synthetic fibre has played a dominant role for a long time in a variety of applications for their high specific strength and modulus.

INTRODUCTION

Concrete is a tension weak material which often affected by cracks in hardened state. These cracks are developed with relative to time and stresses. The inner portion of concrete is often affected by acid attack, sulphate attack. These exposures tends to deteriorate the concrete, also with steel corroding. To counteract these cracks, an important method has come into existence, that is addition of blended fibres. These fibres can help the concrete to become crack free to certain extent. In freshened state , these blended fibres disallows the micro crack formation from developing into macro cracks and causing troubles. By the addition of these fibres, it can act as a bridge between cracks and does not allow the cracks to form quickly. The fibres like polypropylene fibres shows great performance not only to compression, tension and flexural but also to impact loads. Also use of fly ash as a partial replacement of cement which improves the strength behaviour of concrete also reduces the use of cement content in concrete.

In this paper, an investigation has been made to find out strength properties of polypropylene fibre reinforced in comparison with ordinary conventional concrete.

CEMENT

In this study ordinary portland cement of grade 53 has been used as per standard IS 12269-1987. Cement should be clean, dry and free from impurities. There should not been lumps in the cement.

Table 1 Physical properties of cement

S.No	Properties	Obtained Values
1	Consistency test	34%
2	Initial setting time	35 Minutes
3	Final setting time	370 Minutes
4	Fineness test	6%
5	Specific gravity	3.116

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FIBRE

Polypropylene fibre has been used which is made from thermoplastic polymer. Polypropylene fibre chips is converted to fibres. It has high working temperature and tensile strength.

S.No	Properties	Values
1	Length	10mm
2	Diameter	40µm
3	Density	900kg/m^3
4	Tensile strength	600-700 N/mm^2
5	Aspect ratio	250

FINE AGGREGATE

Locally available river sand conforming to grading zone III of IS: 383-1970 is completely washed and sieved through 600µm sieve with specific gravity as 2.65.

COARSE AGGREGATE

Crushed blue granite stones aggregate of maximum size of 20mm and graded as per IS: 383-1970 with specific gravity 2.77.

WATER

Water is to be used for mixing and curing should be free from impurities and injurious materials. Portable water is generally preferable for producing the good concrete. The pH value of the water to be used should be greater than 6. In this study the water is collected from the college and the pH value found to be 7 and it is used for both mixing and curing.

II EXPERIMENTAL STUDY

COMPRESSIVE STRENGTH

The grade of concrete will be M25. The concrete were casted in 150mmX150mmX150mm cube size and tested in compression testing machine (CTM) at 28 days. The load will be noted and compressive strength values are calculated by the formula, the ratio of load to area of cube. The fibres were added to concrete of various percentage such as (0%, 0.05%, 0.10%, 0.15%, 0.20%, 0.25%, 0.30%, 0.35%, 0.40%) total volume of concrete. On the other hand fly ash were added in different percentage (0%, 10%, 20%, 30%, 40%) to the volume of cement.

COMPRESSIVE STRENGTH OF PFRC

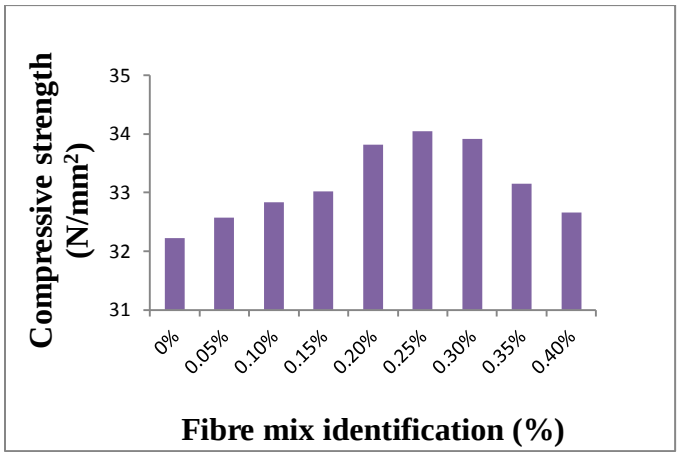

Fig no 1: Compressive strength of PFRC

From the above graph, it shows that the compressive strength values gets increased slightly over ordinary conventional concrete. The maximum strength is obtained at 0.25% of fibre. So that optimized fibre content will be 0.25%.

COMPRESSIVE STRENGTH RESULTS WITH ADDITION OF FLY ASH

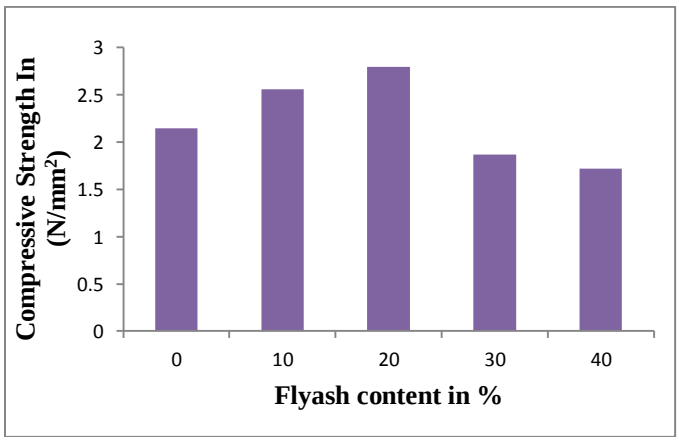

Fig no 2: Compressive strength with addition of Fly ash

From the above graph, it shows that compressive strength values increased over PFRC. The maximum strength will be obtained at 20 % of fly ash. So that optimized fibre content will be 20%.

SPLIT TENSILE STRENGTH OF PFRC

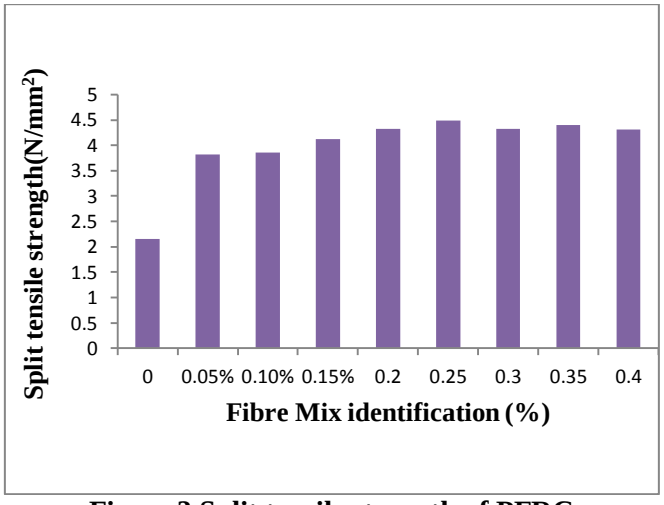

Fig no:3 Split tensile strength of PFRC

From the above graph, it shows that the split tensile strength values get increased slightly over ordinary conventional concrete. The maximum strength is obtained at 0.25% of fibre. So that optimized fibre content will be 0.25%.

SPLIT TENSILE STRENGTH WITH ADDITION OF FLYASH

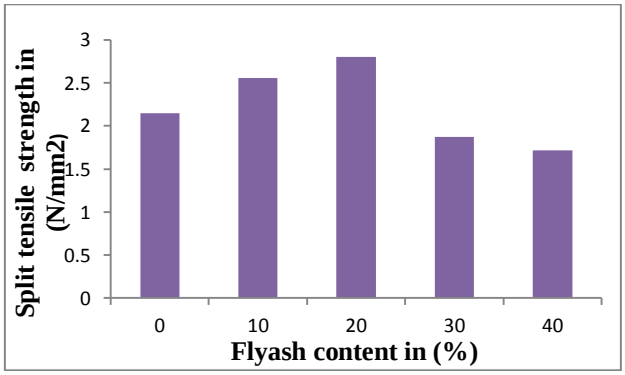

Fig no 4: Split tensile strength with addition of fly ash

From the above graph, it shows that Split tensile strength values increased over PFRC. The maximum strength will be obtained at 20 % of fly ash. So that optimized fibre content will be 20%.

FLEXURAL STRENGTH OF PFRC

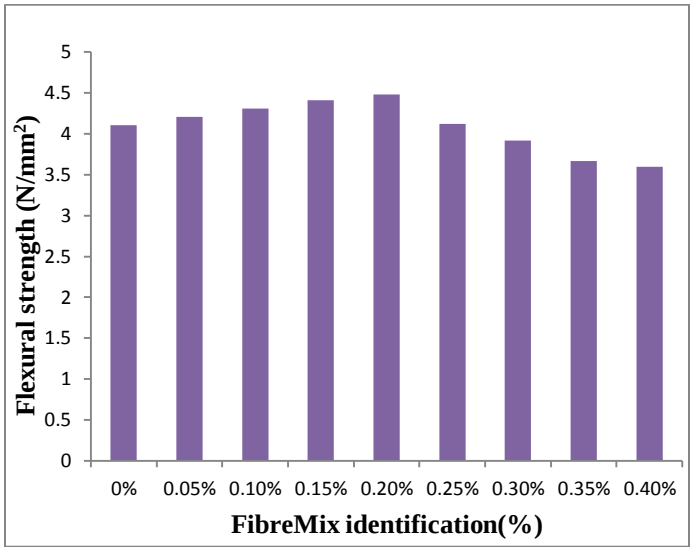

Fig no 5 :Flexural strength of PFRC

From the above graph, it shows that the Flexural strength values gets increased slightly over ordinary conventional concrete. The maximum strength is obtained at 0.25% of fibre. So that optimized fibre content will be 0.25%.

FLEXURAL STRENGTH WITH ADDITION OF FLYASH

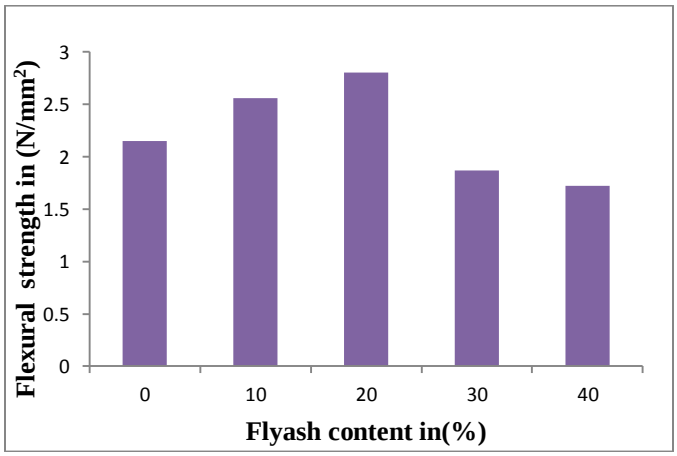

Fig no 6: Flexural strength with addition of Flyash

From the above graph, it shows that Flexural strength values increased over PFRC. The maximum strength will be obtained at 20 % of fly ash. So that optimized fibre content will be 20%.

CONCLUSION

From the above paper I had concluded that optimization of fibre and fly ash has been done. I had found that optimization of fibre and fly ash will be 0.25% and 20% with volume of concrete and cement respectively.

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